"A study on the adoption process for Digital Health Services with the help of integrated hierarchy-based AIDA model and Technology Acceptance Model (TAM)"

Research Proposal for Topic Approval

Submitted in the partial fulfilment of the requirement of the degree of

Doctor of Philosophy (Ph.D.)

In the subject of Management Studies

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1. Introduction

1.1. Healthcare access in India

Access to quality healthcare is still a challenge for developing countries like India. Around, 30% of the Indians are not having access to primary healthcare, 70% of the healthcare infrastructure is limited to Urban areas (PwC Report,2021). 60% of deaths in India are due to non-communicable diseases majorly cardiovascular diseases (PwC report, 2021). Lifestyle has changed disease patterns, changing from conventional to more lifestyle-related diseases. India's health care quality is the lowest among developing countries with 48% satisfaction among patients. India has 80% of doctors, 75% of dispensaries and 60% of hospitals in urban India with 70% population in the rural area (PwC report, 2016). India has 0.7 doctors per 1000 population, for nurses, the number is 1.3 and for hospital beds, it's 1.1. All these numbers are way behind WHO standards. India needs around 64 lakh resources in the healthcare sector (PwC report, 2016)

A relatively high prevalence of mild illnesses such as cough, fever, and diarrhea were found by Desai (2010) i.e. (124 per 1,000 people) in the population of Indians. According to the study conducted by Desai (2010), just 3% of major illnesses go untreated in urban settings, compared to 12% of the same illnesses in rural, less developed communities. Among the scheduled tribes, one-fifth of the significant illnesses that have been diagnosed are untreated. Also, persistently unfavorable attitude toward government buildings, treatment and doctors limits the usage of government facilities by patients.

On the other side, India's smartphone users are increasing with 20-30% of CAGR which is greater than leading countries like China and US (PwC report, 2016). India holds 2nd largest base of smartphone users due to comparatively low tariffs, easy accessibility, and improved infrastructure(De 'Souza et al., 2014). In India, 78% of the web traffic comes from mobile devices. Also, an average Indian spend 2-3 hours on mobile phones daily. As per the study by De'Souza et al. (2014), India ranked among top 5 countries looking out for some digital health searches on google.

As per one of the studies conducted in Rural India, Respondents prefer information around healthy living, nutrition, maternal and rural child health, vaccination, self-care in chronic illnesses and information on infectious disease epidemics. Also, around 98% of chronic patients showed willingness to get medicine reminders through voice calls and more preferably in local language. Almost75% patients are ready to call doctors for their acute illnesses (De'Souza et al., 2014).

1.2. What is Digital Health?

Digital technology has revolutionized various fields like banking, retail, investments etc. Digital technology made various complex task much easier. Digital health holds a very strong potential for health care. Wireless devices, advance technology, and new technique like big data making it more potential (PwC report,2016). Considering the increasing patient load distributed across urban and rural area with limited resources, India needs some alternative health delivery model. Digital health services have potential to emerge as that alternate delivery channel.

As per PwC analysis, digital health is not only limited to digital health or e-health, but it also covers so many other domains like telehealth, big data analytics, medical record, Health IT, wellness apps etc. Day by day, digital oriented consumers are outnumbering traditional consumers. Digital health showed prominence from both private and public sector. Indian government has recently created national digital health policy and linked several schemes with Aadhaar card. In additions to that, entry of various healthcare startups has favored digital health transformation.

1.3. Definition of Digital Health?

The broad definition of digital health, according to the FDA, encompasses "*category like mobile health (mHealth), health information technology (IT), wearable devices, telehealth and telemedicine, and Personalized medicine.*" Digital technology has been driving a revolution in health care, from artificial intelligence and machine learning to mobile medical apps and software. The use of digital health tools has the potential to significantly improve individual patient care by enhancing the accurate diagnosis and treatment of disease. For healthcare and associated purposes, digital health technologies use computing platforms, networking, software, and sensors. These technologies have a wide range of applications, including those for medical devices and applications for general wellbeing.

The May 2018 World Health Assembly (WHO) Resolution on digital health mentioned definition of digital health as "*a wide range of technologies across the spectrum of eHealth, mHealth, telemedicine, and even emerging fields of advanced computing like big data, machine learning, and artificial intelligence*". This is mentioned in the article by Labrique et al., (2020) on WHO guidelines.

1.4. Usage of digital health services in healthcare

As defined earlier, Digital health includes various services with their individual benefits

Mobile health (m-Health) - Mobile health include all the digital services supported by mobile devices. As per (PwC report 2021), m-health is a 5000 Cr market with 68% people in

emerging countries are recommending m-health. Digital health applications include various subcategories as given by Murnane et al. (2015) i.e., mobile applications for physical activities like Training, logging, wearable apps. There are also medical applications developed by service provider for symptom checker and online consultation. In addition to this, various mobile applications related to lifestyle behaviour like weight loss, psychological support and diet-based apps are also included in m-health domain.

Remote diagnosis – Remote diagnosis include use of digital services for sharing medical records, booking lab tests and virtual diagnosis of disease. Remote healthcare delivery market is expected to grow by CAGR 20% (Murnane et al., 2015)

Telemedicine – Telemedicine refers to use of telecommunication technology for diagnosis and treatment of patients. India's telemedicine market estimated to be USD 450 million (Murnane et al., 2015)

Wearable – A wearable is an electronic device that can be used in contact with human body and interacts with other devices to transmit or collect some type of data. Devices which track diet and fitness estimated 30 Cr market in 2018 (Pai & Alathur, 2019)

Various emerging trends can be seen in the digital health space

Big data analytics and Artificial intelligence - Big Data Analytics can provide insight into clinical data and thus facilitate informed decision-making about the diagnosis and treatment of patients, prevention of diseases or others. Big Data Analytics can also improve the efficiency of healthcare organizations by realizing the data potential. Artificial intelligence, machine learning and deep learning enable healthcare stakeholders and medical professionals to identify healthcare needs and solutions faster with more accuracy, using data patterns to make informed medical or business decisions quickly

1.5. Adoption of digital health services

Compared with adoption of TV which took around 75 years, adoption of digital health is taking place at a very faster pace. As per Murnane et al (2015) the primary source from where the users learn about digital health applications is through personal connection (35%), social media (23%), play store suggestion (17.5%), fitness professionals (18%). Surprisingly, healthcare professionals are not the major source of learning for the people downloading digital health mobile applications.

Primary reasons for using digital health are low healthcare cost, convenience of getting services at any time, ability to get faster information, Quality care, better patient outcomes and increase patient engagement.(PwC report,2021).Reduction in doctors' administration

time is another advantage of digital health. If some minor illnesses can be managed by digital health services, doctors can spend their maximum time for critical illnesses.

1.6. Barriers in adoption of digital health

Adoption of digital health in India is growing at a very slow rate. Major challenge in India is around lack of awareness about the digital health and perceived benefits for end users. Poor healthcare infrastructure specially in the rural area limits the usage and adoption of digital health. Considering the culture of medical professionals, people are having very low expectations from the digital health type of alternative healthcare delivery systems. Additionally, In the fragmented market, digital health is not yet successful in generating users' interest in digital health services.

From provider point of view, providers are unwilling to work in digital health space. Also, there are no standard applications for relevant health care delivery. On top of this, high implementation cost of digital health services limits its usage for providers too. (PwC report,2021)

As per the study conducted by Murnane et al (2015) around mobile health abandonment, primary reason for discontinuing mobile health applications is the consumer belief around mobile battery which is getting drained due to digital health apps. In addition to this, phone incompatibility (13.4%), mistrust of the app's developer (6.1%), lack of desired features e.g., tracking, notifications (25.5%), and inability to use an app in a particular living environment e.g., communities with low walkability (6.1%).

1.7. Need of the study

India being the highest users of smartphones also lead medical app searches on google which indicate their interest in medical applications. Although, people have started exploring various digital health services, there are various barriers for Digital health services management such as cost, insufficient scientific evidence, data protection and regulatory barriers (Shah & Garg, 2015). On the other hand, as per the report from PwC, India has lowest ratio of healthcare staff to overall population.

Although the use of smartphones has become common place and people are exposed to situations with digital health services, adopting digital technology involves more anxiety than simply purchasing a good or service. In other words, service information can prompt consumer interest in new technology, but the consumer must take several steps to accept these innovations.

Though the accumulated knowledge provides some insights about the users and various factors impacting digital health services, there is a gap in literature reflecting the lack of

research on hierarchy-based models in understanding adoption of Digital health services and factors affecting intention to adopt such services especially in India. Hence, the main aim of this study is to explore the adoption process with the help of integrated hierarchy bases AIDA model (Attention-Interest-Desire-Action) and TAM (Technology Acceptance Model).
Integration of two theories along with other impacting factors for understanding consumers intention to adopt digital health services will have important addition to the current knowledge around digital health.

Problem Statement

COVID-19 has created the necessity for the establishment of collaborative, robust, accessible healthcare systems with improved efficiency which can be achieved with the help of latest digital healthcare services. However, limited understanding around adoption process of such digital health services in India demands for further research around digital health.

2. Review of literature

Digital health services offer the potential to increase our capacity to make accurate diagnoses, treat diseases, and improve patient care. Additionally, patients will feel more empowered to take charge of their health and make better-informed choices because of this. With so many people now relying on the internet and digital devices for access to medical services and treatments, the recent COVID-19 epidemic has underlined the crucial relevance of digital technologies in healthcare. In accordance with the study by Awad et al., (2021) digital health also presents a wide range of potential to support prevention, early detection of life-threatening disorders, and management of chronic ailments outside of traditional health care settings.

In the conventional healthcare system, people often go to a general practitioner for a check-up and tend to seek medical assistance when new symptoms arise. With the growing accessibility of reasonably priced digital technology, such as wearables, which provide patients with immediate access to clinical data in real-time.

Although 90% of smart phone users have looked for health information online, only 45% are aware of and familiar with the team mobile health. Awareness levels also differ as per the background of the respondent, i.e., a comparatively higher level amongst medical staff and technical students. The impact of awareness around booking an appointment and locating hospitals is higher than medical reminder data storage and all (Pai & Alathur, 2019)

Although the use of smartphones has become commonplace and people are exposed to situations by using mobile apps, adopting technology such as digital health services involve more anxiety than simply purchasing a good or service.

To analyze the past literature, a review was started with a bibliometric analysis of various research papers published in the last 20 years related to digital health. This section outlines the literature review in 5 phases.

2.1 – Bibliometric analysis

2.2 – Perceptions and Factors influencing adoption of Digital Health

2.3 – Stages of Digital Health adoption process

2.4 – Integration of two adoption theories

2.5 – Initial information gathering through Qualitative Research

2.1. Bibliometric Analysis

Based on the initial literature review, bibliometric analysis was carried out as per the approach mentioned by Donthu et al., (2021) with the help of the database of research papers available

in SCOPUS. Important key words like digital health, mobile health, m-health, telemedicine was used while searching the database. Searched data was extracted in CSV and further used for analysis in the software VOSviewer.

A total of 4085 papers that were published between January 1992 and March 2022 in SCOPUS related to screening criteria. Screening of collected research papers was performed by removing duplicates and filtering relevant articles consisting of health in title or key words. 1194 documents were removed, including 92 duplicates. Finally, 2891 research papers were shortlisted for analysis as referred in Figure 2.1.

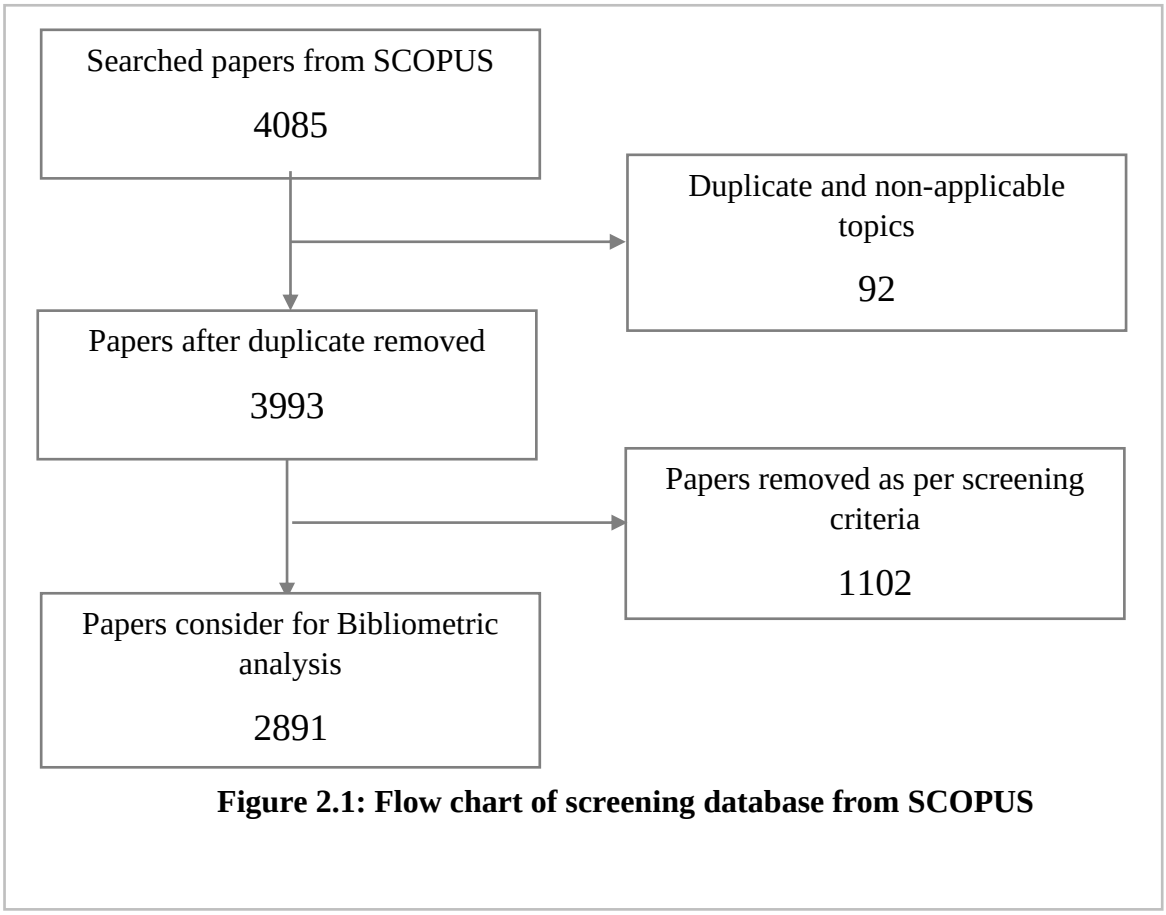

Figure 2.1: Flow chart of screening database from SCOPUS

Analysis techniques: Using bibliometric analysis, it is possible to identify distinct trends and insights from previously published literature by extracting certain measurable data. Previous literature was analysed with the help of various techniques like publication trend analysis, country wise publication, key word analysis, citation analysis, co-citation analysis, co-author analysis and bibliographic coupling.

Findings:

Publication trends: From the year 1992 to 2020, the average growth rate of published research papers in the domain of digital health was 24.01%. However, exponential growth in the research of digital health took place from 2010 onwards, accounting for approx. 90% of the total published documents. This analysis showed the incremental demand and innovation happening in the digital space. (Figure 2.2)

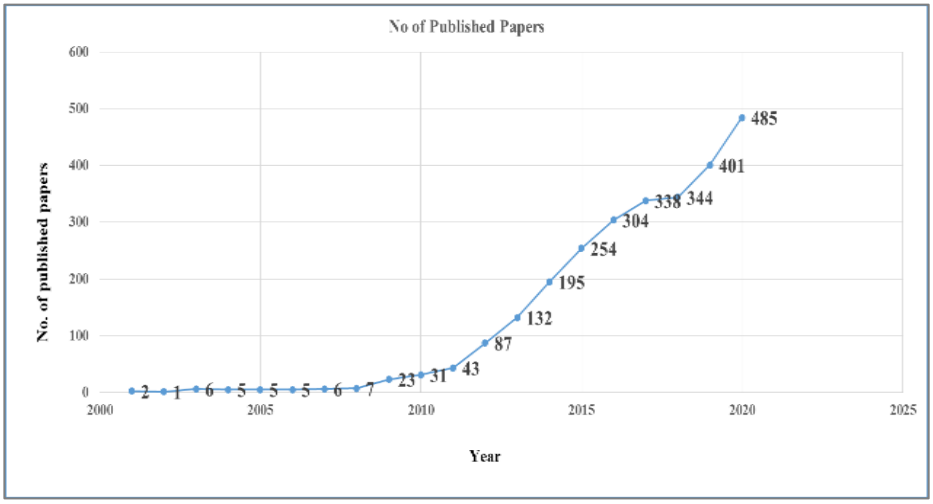

Figure 2.2: Number of research papers published related to digital health

Country wise documents: The majority of papers (30%) were published in the United States. The United Kingdom and Australia are the next two most paper-publishing countries. These results showed very limited studies and research in India around the digital health space. (Figure 2.3)

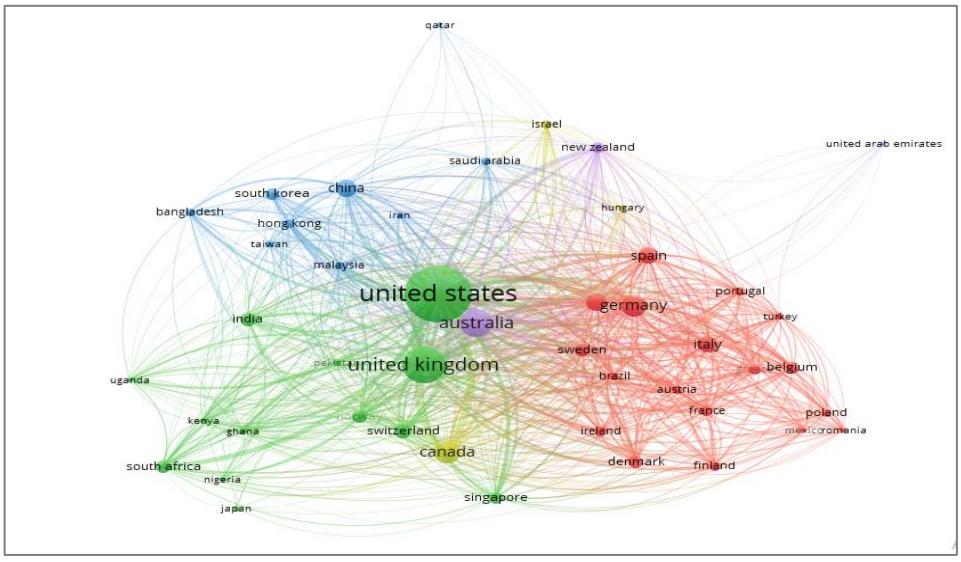

Figure 2.3: Country wise publications related to digital health. Source: VOSviewer software chart

Key word analysis: Key word analysis indicates the most tested concepts or keywords in the past. While doing the keywords analysis, 5 major clusters emerged, i.e., digital health, telemedicine, mobile applications, consumer profiling, and COVID related research. This analysis indicates a link between various components of digital health (Figure 2.4)

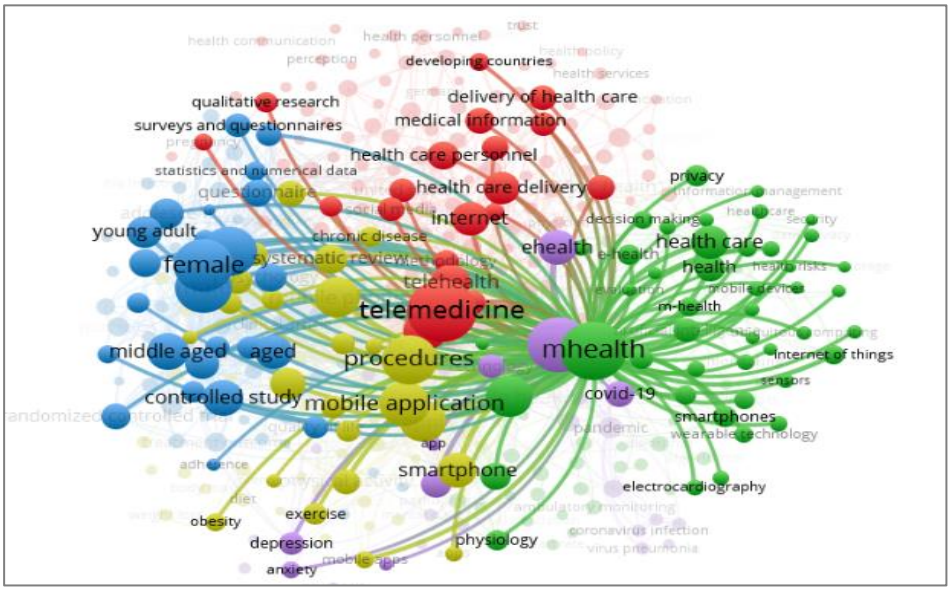

Figure 2.4: Key words analysis related to digital health. Source: VOSviewer software chart

Citation Analysis: The United States receives the most citations in the digital health space, followed by the United Kingdom and Australia (Table 2.1)

Table 2.1: No of citations related to digital health

Country	No of citations	% Of citation
United States	80619	30%
United Kingdom	29586	11%
Australia	18900	7%
Canada	11073	4%
Germany	7486	3%
Netherlands	7895	3%
China	9751	4%
Spain	9030	3%
Italy	6554	2%

Also, the maximum citations were observed in 'Journal of Medical Internet Research and JMIR mHealth and uHealth journals (Figure 2.5).

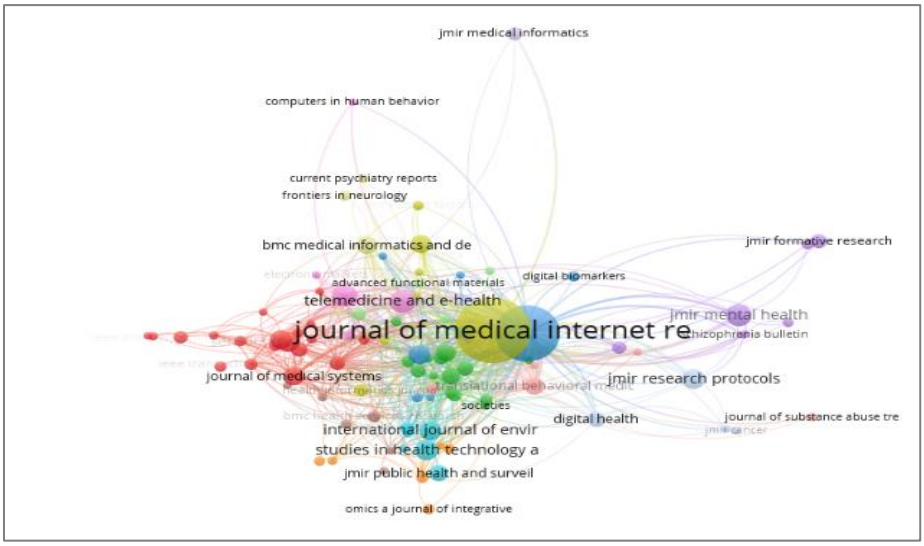

Figure 2.5: Journals related to digital health publications. Source: VOSviewer software chart

2.2. Perceptions and Factors influencing adoption of Digital Health Services

If researchers want to promote long-term use of digital health, they must first understand the features that patients value, as well as their views, capabilities, requirements, characteristics, and preferences. Limited digital literacy, low awareness, and cost are the main obstacles to the adoption of digital health. Similarly, Peng et al., (2016) discovered that increasing public understanding and acceptance of health applications is dependent on increasing knowledge of them. As per the definition given by FDA and WHO, Digital health includes services like mHealth, Wearable, Telemedicine and Information and Communication technology for health. Below is the summary of literature reviewed as per various digital health services.

2.2.1. Mobile Health

As per the study conducted among US mobile phone owners, most of the popular categories in digital health services were fitness and nutrition, with most respondents using them daily. Lack of interest, expense, and concerns about applications' collecting their data were all common reasons for not downloading apps (Krebs & Duncan, 2015). Regarding theories and models applied to digital health adoption studies, the technology acceptance model (TAM) is the most used model, followed by UTAUT over other theories.

According to a meta-analysis conducted by Zhao et al., (2018)), behavioral intention was significantly and favorably correlated with perceived utility, perceived danger,

subjective norms, perceived ease of use, trust, and attitudes. For example, Aiman Azhar & Singh Dhillon, (2018) conducted a systematic literature review and identified seven key factors, including perceived usefulness, social influence, perceived privacy risk, perceived ease of use, self-efficacy, attitude, and behavioral intention, that were found to significantly influence the adoption of digital health services.

Some key research studies are summarized below.

Reference	Topic	Country	Theory	Variables	Research Gaps
(Alam et al., 2018)	Using the UTAUT Model to Determine Factors Affecting Acceptance and Use of Mobile Health (mHealth) Services in Bangladesh	Bangladesh	UTAUT	Dependent: BI Independent: PE, EE, SI, FC, PR	1. Small Sample Size and limited geography 2.Only covered m-health
(Dou et al., 2017)	Patients' Acceptance of Smartphone Health Technology for Chronic Disease Management: A Theoretical Model and Empirical Test	China	TAM modified	Dependent: Intention to use, Actual use Independent: PU, PEOU, SI, User experience, RTC, Perceived threat, SE, Relationship with doctor,	1. No construct around Privacy concerns 2. Small Sample size and limited geography
(Punit & Mishra, 2018)	Mobile health app adoption in India: a comparative study	India	TAM modified	Dependent: BI Independent: PU, PEOU, Trust, ATT	1. Not included wellness 2. Female focused sampling

(Almegbel & Aloud, n.d.)	Factors Influencing the Adoption of mHealth Services in Saudi Arabia: A Patient-centered Study	KSA	UTAUT	Dependent: BI, Actual Usage Independent: PE, EE, SI ,FC, PR ,PV,	1. Not applicable to other healthcare services like EHR
(Palos-Sanchez et al., 2021)	Toward a Better Understanding of the Intention to Use mHealth Apps: Exploratory Study	Spain	TAM modified	Dependent: BI Independent: PU, PEOU, ATT Prevention of Health, Health benefits	1. Country under study 2. Specific analysis technique

PE-Performance Expectancy, EE-Effort Expectancy, SI- Social Influence, FC-Facilitating Condition, PR-Perceived Reliability, BI-Behavioral Intention
PV - Price Value, PU- Perceived Usefulness, PEOU-Perceived Ease of use, SE - Self Efficacy, ATT- Attitude, RTC – Resistance to change

2.2.2. Wearables / Information and communication technology /Telemedicine /eHealth

Wearables are the gadgets that come across the body's touchpoints and track several important bodily health indicators. In India, wearable technology usage is steadily rising. There aren't many studies explaining the uptake of wearable technology, though. Wearables are more readily adopted by younger people than by older people. The adoption of wearables is influenced by several factors, including perceived satisfaction and personalization, Mohamad Taib et al., (2016). Additionally, performance expectancy is positively impacted by perceived benefit, perceived threat, and efficacy. (Wei et al., 2021)

Some key research studies can be summarized as follow.

Reference	Topic	Country	Theory	Key factors tested	Research Gaps
(Mohamad Taib et al., 2016)	Innovation Diffusion of Wearable Mobile Computing: Pervasive Computing Perspective	Malaysia	TAM Modified	Dependent: ITU Independent: PU, PEOU, SI, Mobility, FC, Personalization, Perceived Enjoyment	1. Limited Geography 2. Focus on only Wearable
(Wei et al., 2021)	Understanding and Predicting the Adoption of Fitness Mobile Apps: Evidence from China	China	UTAUT+HBM	Dependent: Usage Behavior, BI Independent: PE, Risk Perception, Perceived Benefit, Barriers, Threat, SE	1. Focus on only Fitness app 2. Single National group
(Li et al., 2016)	Examining individuals' adoption of healthcare wearable devices: An empirical study from privacy calculus perspective	China	TAM modified	Dependent: BI, AI Independent: PEOU, PU, Information sensitivity, Innovativeness, Legislative Protection, Perceived prestige, Perceived informativeness	1. Only explained 15% of adoption variance 2. Only Chinese sample

(Kijsanayotin et al., 2009)	Factors influencing health information technology adoption in Thailand's community health centers: Applying the UTAUT model	Thailand	UTAUT	Dependent: Voluntariness Intention Independent: PE, EE, SI, Knowledge, Experience Use Frequency, Care and Report Use, Administration Use	1.Related to IT domain 2. Limited geography
(Rho et al., 2015)	Factors influencing the acceptance of telemedicine for diabetes management	China	UTAUT	Dependent: BI Independent: PE, EE, SI, FC	1. Focus on only Diabetic patients 2. Not considered any external variables

PE-Performance Expectancy, EE-Effort Expectancy, SI- Social Influence, FC-Facilitating Condition, PR-Perceived Reliability, BI-Behavioral Intention
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2.3. Stages of Digital Health adoption process

AIDA model

The AIDA model represents a conceptual model that classifies behaviourally progressive phases: (1) attract the audience's Attention, (2) attract the audience's interest, (3) create a desire for the product or service, and (4) inspire purchase. The AIDA model has been widely applied to evaluate individuals' future intentions, influenced by marketing activities such as promotions, advertising, sponsorship, and business (Petit et al., 2011)

Attention

When it comes to marketing, paying attention to an advertisement is being aware of it. An advertising message's goal is to catch people's attention, or to offer something compelling enough to get them to read, listen, or watch the message. When someone concentrates on the message in an advertisement, that person is paying attention (Vakratsas & Ambler, n.d.). The goal of advertising is to grab people's attention.

Interest

Interest is the readiness and willingness to process the information provided by the message. The level of interest in advertising messages can be heightened in individuals by appealing to the individual's needs or wants thereby increasing the likelihood of trial. Individuals become curious or interested in an advertising message and the advertised product based upon appeal to the needs or wants of those individuals. Information presented preceding these messages also increase the interest in the messages (Jin, 2003).This occurs when new television advertisement messages or new products are announced before the advertising is launched. Finally, Vakratsas & Ambler in conceptual articles agree that unique product attributes increase interest in processing the message because individuals want to learn more about the unique attribute

Desire

Desire stresses the strength of a feeling often implying strong intention as in longing for or hoping for something. Desire for a product is heightened if that product enhances the individual's feeling of belonging or identity. Desire based on social identity can range from the preteen demanding specific name brand jeans to the adult purchasing a favorite team jersey. Consumption is driven by obtaining products that friends, family, and other reference groups consume. Relationship between Advertising, Motivation (Interest, Desire) and Action

Action

The AIDA model illustrates how Interest then Desire leads to Action. As Interest changes, Desire changes, resulting in changes in the likelihood of Action. The advertising message affects the level of interest in the individual. If Interest increases, then Desire increases which, in turn, leads to Action. However, if Interest is non-existent or decreases, there is little or no Desire to Act. The direction and degree of Motivation is reflected in the combination of Interest and Desire. Motivation (Interest, Desire) describes an individual's openness, willingness, and readiness to process information and/or act. Interest and Desire, as aspects of Motivation drive the individual to seek an outcome (Bagozzi et al., 2003)

2.4. Integration of two adoption theories

Attention in the AIDA model influenced all five constructs (attitude, subject norms, positive and negative anticipated emotions, and perceived behavioural control) interest from the AIDA model and the other constructs (positive and negative anticipated emotions, subject norms, perceived behavioural control, and the frequency of past behaviour were found to influence desires. Finally, desire to engage in an action was found to be the most critical factor in explaining behaviour (Lee et al., 2018)

Interest was strongly linked with the key structure of TAM, whilst both models determined the attitude. Attitude significantly influenced the preferred intention toward a tourism mode. The impact of interest on preference intention toward VR tourism was greater, due to the mediating effect of perceived usefulness, attitude, and desire(Geng et al., 2022)

It was found that attention was a strong factor in forming interest. In addition, interest in the AIDA model was a significant factor in consumers' perception of usefulness and ease of use Perceived usefulness and perceived ease of use strongly affected attitude. Furthermore, attitude from the TAM was found to influence desire in the AIDA model. It was also found that desire to engage in certain action was the most critical factor with the most explanatory power towards behavioural intention(Song et al., 2021)

2.5. Initial information gathering through Qualitative survey

Methodology:

Primary information basis the in-depth interviews with some digital health services users. We have interviewed Fitness, Diet service users and medical health services users as per the profile given below

Sample size

Participant Category	**Sample size for Qualitative interviews**
Fitness and Diet Services Users	5
Medical Health Services users	5
Total	**10**

Due to COVID 19 pandemic, all in-depth interviews were conducted through a virtual meeting platform i.e. google meet. All these discussions were started with a warm-up section where participants were asked to introduce themselves followed their health-related routine

practices. All in-depth interviews were recorded, and then important phrases were transcribed, and further data analysis was carried out with the help of qualitative analysis software Nvivo and Atlas ti.

Findings:

Faster access to healthcare services and convenience are found to be strong drivers of the adoption of digital health services. As per the word frequency count percentages, certain words like Health, Google, online and personal were repeated by most of the respondents. This indicates the interest levels of consumers in digital services

Adoption process

Attention to intention to adopt digital health

Overall, awareness about digital health services has increased due to the seriousness of health and hygiene aspects because of the pandemic. COVID 19 has also helped in getting consumers' attention towards various digital health services related to maintaining fitness, Yoga training and a diet for healthy weight. At the same time, various healthcare needs were answered on a virtual platform like teleconsultation. The primary source of awareness is digital media platforms like Facebook, Instagram, and YouTube. The primary motivation for generating interest in the digital health services is the need for good health and immunity that emerged due to COVID 19 pandemic. Many users have started using these services during lockdown when all other options of fitness and health were not accessible. People have understood the importance of immunity and fitness in fighting against the pandemic of COVID 19. In the absence of proper medical facilities, most of the respondents have desired for m- health services for accessing medical facilities

Users have downloaded digital health services due to a strong desire to couple with the external pandemic situation. However, after downloading the applications and trying free services, most of the users liked the same and upgraded to a paid subscription. Getting paid subscriptions from branded players were driven by the discounts offered by the brands and the continence of getting multiple experts during multiple timeslots.

Factors influencing adoption of digital health services

Perceptions around usability

Being a digital service and related to health, consumers evaluate the utility of the services. While evaluating new age digital health services in comparison with traditional services, the

convenience of choosing service from multiple options, the convenience of using services as per the need, no waiting time, after sales service, 24X7 availability are some of the factors which drive the usefulness of m- health services as given below figure.

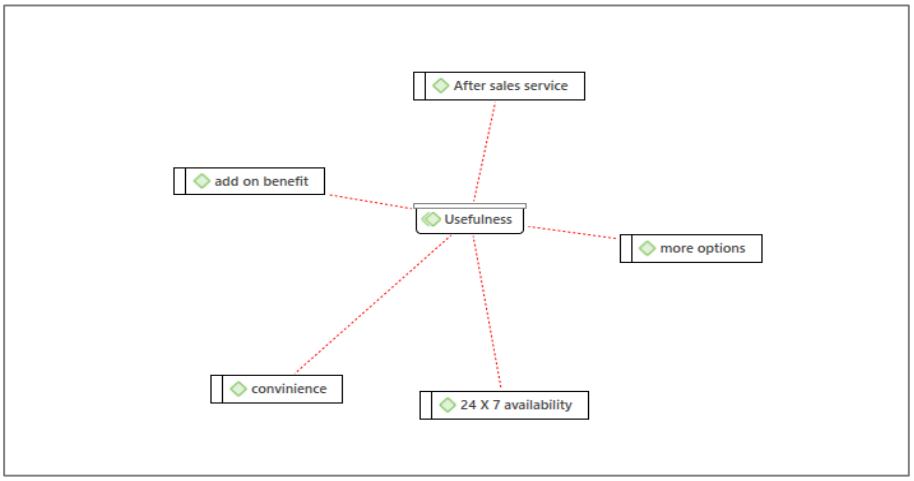

Figure 2.6 : Network relationship between usefulness and other factors

Users find the layout and operations of the digital health service apps perceived to be easy to use. Users have cited a few concerns for the geriatric population for whom managing such technology-related systems can be a challenge. The use of digital health services for managing critical health parameters regularly is still considered to be challenging.

Facilitating conditions

An increasing number of smartphone users with the availability of internet data has helped users in accessing and using the digital health services. Also, more options, personal attention, 24X7 availability of experts, time saving, good aftersales service are some of the facilitating conditions for generating interest in digital health service

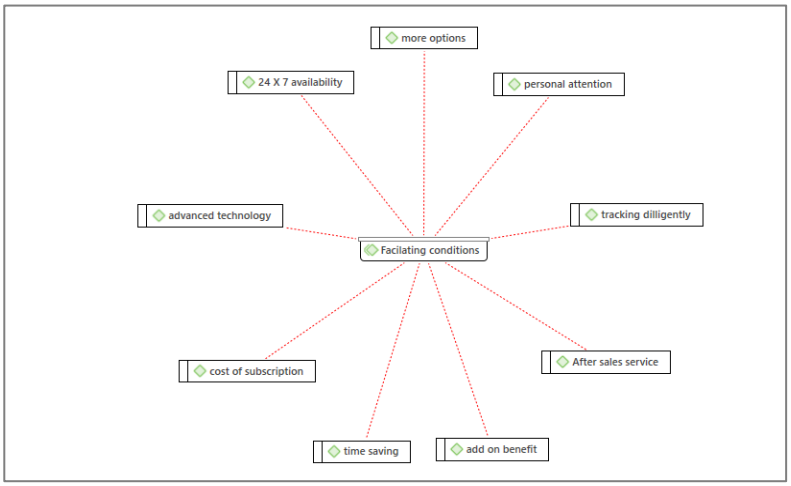

Figure 2.7: Network relationship between Facilitating conditions and other factors

Social influence

Friends and relatives from the society have influenced their usage of digital health services, where they track daily fitness performance of each other and notify that on social media platforms like Facebook. Along with maintaining good health, people prefer to post their health-related achievements on social media to showcase to the external world. At the same time, they also track the health performance of their close friends

Price value

Some of the users are using paid subscriptions of the digital health services. The primary reason for a paid subscription is the economic cost of a subscription in comparison with the conventional alternatives. Also, the convenience of attending all health sessions as per your own schedule makes this a value for money proposition

Data security

Data security is not mentioned as a concern by anybody from the users' samples. People perceived that if they provide access of their information only when it's in use, the app will not interfere with other services and security. In addition to that, services coming up from good brands cannot afford to do such data breaches. Such data security breaches will impact their overall reputation.

Trust

Considering the personal touch, doctors' awareness about family history and reliability of services has built confidence in traditional health services. Branded players in the market, advances in technology and reviews from close friends and relatives have helped digital health services to gain trust amongst consumers at least for preventive fitness and diet-related services. Additionally, users can trust digital health services for acute ailments but are skeptical about critical illnesses.

Health belief / Perceived health threat

Digital health services like online consultation with a doctor, booking doctors' appointments, booking lab tests etc. are very useful services for minor health ailments like headaches, coughs, and colds. However, when it comes to more severe/critical diseases, people prefer more in-person consultation and offline healthcare services.

As the risk of getting COVID was high in last 2 years, online health services have helped

people to consult doctors with a virtual platform without much of risk of COVID 19. When compared with digital health services for supporting health-related concerns, people are preferring their family doctor who knows their history, prior treatment, allergies etc.

Review of literature was consolidated with analysis of both past research papers and initial information gathering. This has helped in building theoretical construct and sharply defining research objectives,

3. Research Gaps

After reviewing past literature for digital health services, various research gaps were identified around geographical coverage of the study, categories or services considered in the study, research approach and moderating variables.

3.1. Geography relevance: As referred in Bibliometric analysis, most of the digital health studies were published in high economy western countries. There are very few studies pertaining to digital health adoption in India. Also, no studies comparing adoption across Indian metros (Bibliometric analysis, Alam et al., 2020))

3.2. Category relevance: Most of the studies completed in the past were focused upon only mobile health. There were very few studies on categories like telemedicine, online consultation, wearables etc. No comprehensive studies were available for digital health.(Gong et al., 2019; Kvedar, 2020)

3.3. Adoption process: All the studies in the past literature were based upon finding different factors influencing intention to adopt Digital health services or acceptance. There were no studies explaining various psychological, emotional factors impacting adoption. Also, adoption of any technology follows series of stages. There were no studies on explaining hierarchy-based stages of adoption(Kollmann, 2004)

3.4. Moderating variables

Very few studies focused on the elderly population and differences in adoption across age group. No studies on moderating impact of Education. Hence, there is a significant scope for testing more moderating variables.(Rahman et al., 2017)

3.5. Single theory-based explanation

Various theories like Technology acceptance model, Theory of planned behavior, Health belief model etc. were used in the past to explain impact of various factors influencing adoption of Digital health services. However, no single theory was successful in explaining complete adoption of Digital health services due to their own limitations (Song et al., 2021).

4. Research Questions and Objectives

4.1. Managerial questions

4.1.1. Perceptions and Factors influencing adoption of Digital Health

Traditionally, Indian patients visit doctors/healthcare facilities only when they experience disease symptoms. Digital health demands shift patients from conventional healthcare to digital services. While making this transition, patients have various beliefs, perceptions that are driving their interest towards digital health or away from digital health (Peng et al., 2016). Digital health service providers and conventional healthcare providers are interested in finding out various perceptions and factors that are impacting adoption of digital health. It would be interesting to know how consumers' attitudes impact on their intention to adopt.

Additionally, consumers consider various factors while selecting digital health services. Ideally, it must cover the usefulness / utility of the service, ease of use, impact from society and various facilitating conditions. It is important for management to understand the impact of various factors on adoption.

4.1.2. Stages of Digital Health adoption process

Previous literature on the topic explains various factors impacting adoption of digital health services. However, healthcare providers would prefer to know more about the adoption journey of digital health. Every adoption starts with getting consumer attention. It would be interesting to know how consumers are becoming aware of digital health services, different sources of awareness, and differences in awareness as per age group (Bansode Gokhe et al., 2020).

Every technology adoption follows specific stages. It is also crucial to know different stages of adoption, i.e post attention, what drives consumer interest, desire, and the impact of desire on intention to adopt (Geng et al., 2022). Finding triggers which are impacting adoption stages is also important for the management.

4.1.3. Integration of two adoption theories

For healthcare provider management, it is important to understand overall comprehensive information about consumer adoption of digital healthcare in terms of both factors impacting adoption and stages of adoption (Song et al., 2021). It would be interesting to know how one can enhance consumer adoption and continuous usage of digital health services while minimizing dropouts.

Across geographical locations, adoption of digital services may differ from country to country. It would be good to know for service providers how differently patients are adopting digital health across cities and demographic indicators. Various demographic factors like gender, age, and income impact adoption of digital health, which needs to be understood properly for better execution (Guo et al., 2015)

4.2. Research Questions

A research question resides at the core of systematic investigation, and it helps you to clearly define a path for the research process.

4.2.1. Perceptions and Factors influencing adoption of Digital Health

To understand consumer perceptions, researchers need to focus on how people rate digital health services. In this approach, one must find out the differences between the importance ratings of both healthcare services. In addition to this, for mapping the impact of perceptions on intention to use, it is important to find out the positive or negative influence of various latent clusters like perceived usefulness and ease of use. Also, as per TAM theory, the impact of perceptions is mediated by the attitude of a consumer (Atienza et al., 2015). Hence, what is the impact of attitude towards using digital health technology and experience in India?

Similarly, there are various factors which motivate consumers. Finding the influence of all those motivating factors, like social influence, on the intention to adopt is another important research question. Besides motivating factors, there are other factors which influence intention to adopt, like price value, health beliefs, etc. Finding out what influences in a negative way the intention to adopt also needs to be addressed.

4.2.2. Stages of Digital Health adoption process

To get consumer attention, it is important to understand the levels of attention and sources of attention or awareness. While drafting the adoption journey, one has to find the various stages of adoption. Dependency and interlinking between all the stages need to be found. Finding out the impact of perception on the adoption journey is also an important question (Song et al., 2021).

4.2.3. Integration of two adoption theories

Research needs to answer the impact of the integration of two different theories for a better explanation of the intention to adopt digital health services. This will include the

impact of various adoption factors on adoption stages and their cumulative influence on intention to adopt (Geng et al., 2022)

Research needs to also answer, how various geographically different cities differ in terms of adoption of digital health services along with the variations in moderating factors like age, gender, income.

4.3. Research Objectives:

In line with the problem statement, the primary objective of the study is to decode adoption process with the help of integrated model of AIDA and TAM.

Perceptions and Factors influencing adoption of Digital Health:

1. <u>To determine the influence of consumers perceptions and different factors on intention to adopt digital health services with the help of Technology acceptance Model (TAM)</u>

   To potentially improve the quality of healthcare delivery, digital health technologies are being used more and more frequently in healthcare-related fields. However, speed of implementation of these technologies in healthcare systems is still a challenge, especially in the setting of developing nations (Ahlan & Ahmad, 2014). It is also important to understand consumers attitude towards digital health services. As per the past literatures, consumer attitude is typically driven by usefulness of the product and perceived ease of use(Atienza et al., 2015). Considering the motivations and barriers for adoption of digital health services, one of the core objectives of this research is to determine the influence of various perceptions and factors impacting adoption. Various perceptions like perceived usefulness, Perceived ease of use are some of the important perceptions impacting the attitude of adopting digital health services(Tam et al., 2020). In addition to that various factor like Trust, social influence, Data privacy are also influencing adoption of digital health services.

Stages of Digital Health adoption process

2. <u>To validate the AIDA model for explaining the adoption of Digital health services and stages of adoption process</u>

   In the absence of hierarchy- based adoption process post first exposure to the technology services; it is important to understand various stages of adoption. The second objective of this research is to find out various stages of adoption process with the help of AIDA model(Song et al., 2021). Considering the research gaps around availability of hierarchy-based adoption process for digital health, it is important find out the adoption journey

starting from consumer attention to adoption. This would be important addition to the existing knowledge of Digital health services.

Integration of two adoption theories

3. To establish the relationships between intention to adopt and variables impacting adoption as per integrated AIDA model and TAM Model

   As any one theory is not sufficient for explaining adoption of digital health, integrated approach needed for better explanation of intention to adopt digital health (Geng et al., 2022). Thus, the third objectives of this research are to integrate both TAM and AIDA theories and establishing relationships between various variables and intention to adopt digital health. Considering the limitation of both theories, integrated model will help in getting better explanatory model for adoption of digital health services. In the integrated model, AIDA will support stages of adoption process and TAM ensures integration of all factors impacting adoption of digital health services.

5.Theoretical framework and hypothesis development

To develop theoretical construct, 65 research papers (focused on adoption) from the Bibliometric analysis were used to carry out systematic literature review. From 65 studies shortlisted research papers, various theories tested for adoption of digital health were analyzed (Figure 5.1)

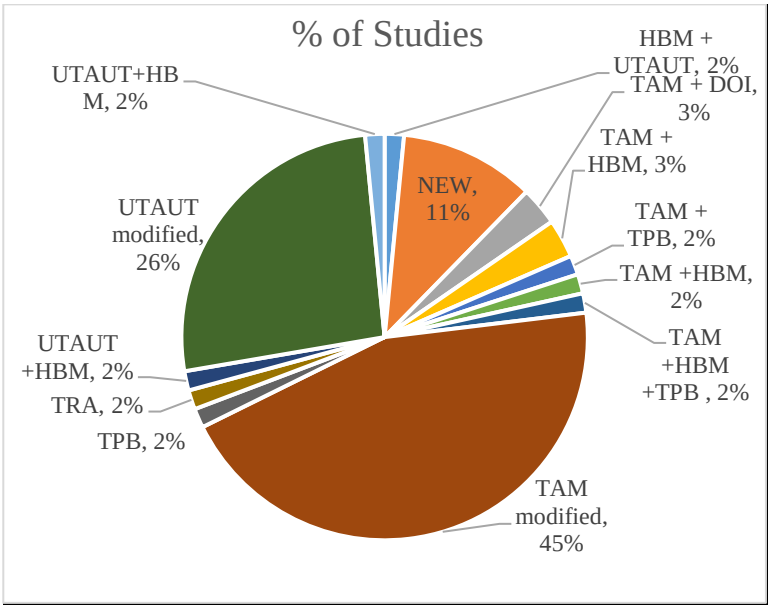

Figure 5.1: Theories tested in the past publications related to digital health, Source: Systematic analysis of literature

From various theories tested in the past, TAM along with its modified combinations are coming up as a most tested theory for understanding digital health services / Health informatics and mHealth.

5.1. Technology acceptance model (TAM)

TAM is the most tested theory in the past for understanding adoption of health information technology and digital health. Also, as per the qualitative initial information gathering, variables of TAM i.e perceived usability and Ease of use are coming up as an influential factor on intention to use. Hence, TAM must be a part of the theory to understand adoption process

Factors tested / Variables

Also, From the systematic analysis of literature review, it is quite evident that Perceived usefulness, Perceived Ease of use, social influence and Trust are the most tested variables in the past (Table 5.1). Top 10 most used variables selected from the systematic literature review for the analysis in the proposed model.

Table 5.1: Frequency of the studies as per variables tested for adoption of digital health

Dependent Variables: Intention to Use / Usage intention / Intention to accept - **65 Studies**

Independent Variables	No of Studies
Perceived Usefulness / Performance expectancy	55
Perceived Ease of Use / Efforts expectancy	49
Social Influence	23
Trust / Privacy/Security	23
Facilitating conditions	21
Health Habit/ Belief	16
Price Value	16
Attitude	12

Thus, Basis the most tested theory and most tested variables, modified form of the TAM theory will be validated in this research for understanding consumers perceptions and factors impacting on adoption of digital health

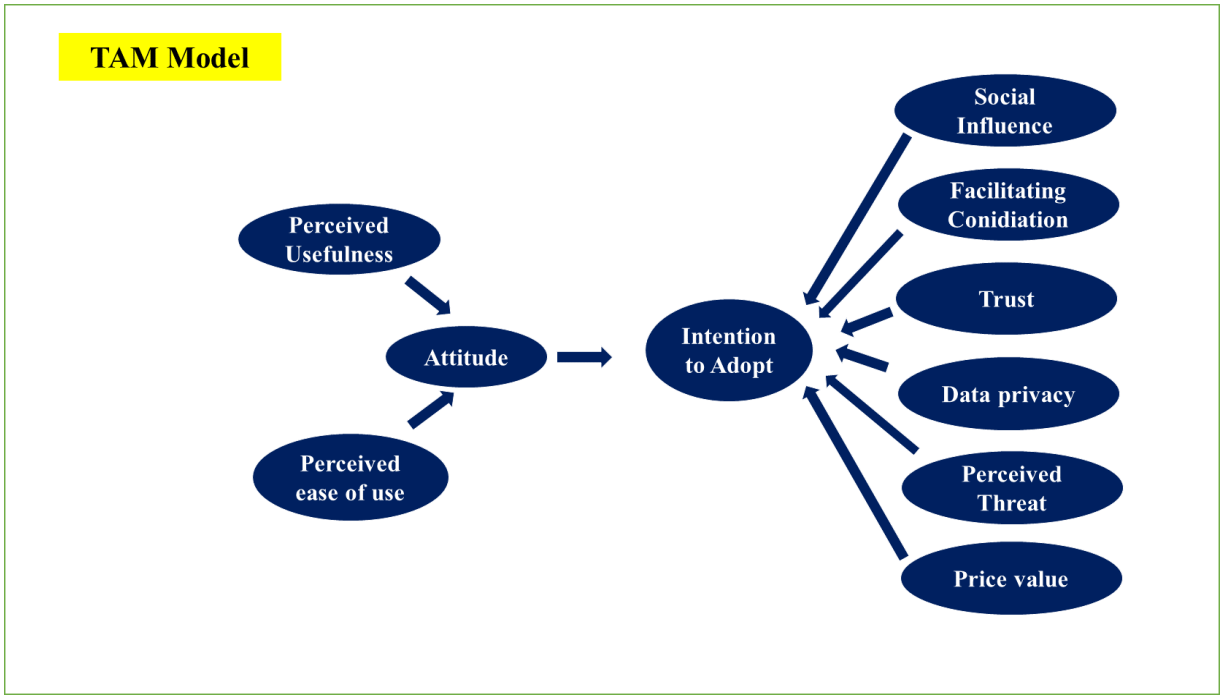

Figure 5.2: TAM modified model

Limitations of TAM

TAM is the non - hierarchy based theory explaining only factors impacting Adoptions. TAM does not take journey of adoption post receipt of communication / evaluation by consumers. TAM had limitation in explaining individuals' situations such as money, resources, and opportunities (Holden & Karsh, 2010). Also, TAM theory's explanatory power to predict behaviour intention ignores several other factors like e.g psychological reaction. TAM alone is comparatively weak in accounting for user behaviour in accepting a technology.

5.2. AIDA model

To understand various stages of purchase behavior, several research were done where researchers have integrated various stages of AIDA model. Overall approach of AIDA model was given by American advertising and sales pioneer, E. St. Elmo Lewis (1910). AIDA models stand for attention-Interest-Desire -action. (Figure-5.3) As studied by Geng et al., (2022) ,attention of consumers will lead to interest. Interest was strongly linked with the key structure of TAM, whilst both models determined the attitude. Attitude significantly influenced the preferred intention toward a tourism mode. The impact of interest on preference intention toward VR tourism was greater, due to the mediating effect of perceived usefulness, attitude, and desire. Validating AIDA model to understand the adoption of digital health will be important addition to the current literature.

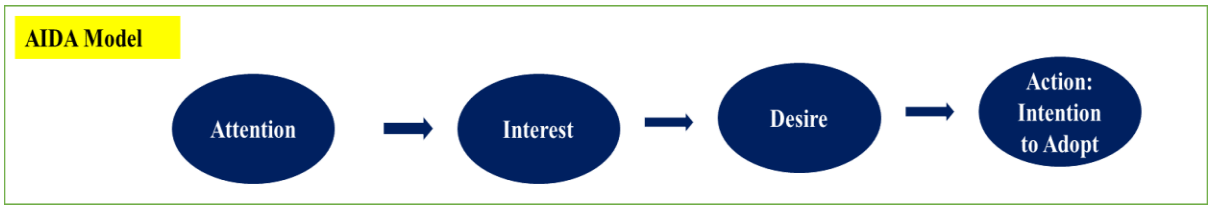

Figure 5.3: AIDA model

Limitations of AIDA model

AIDA does not focus on impact of various factors on intention. In addition to this, AIDA does not consider various perceived factors into account which are impacting final action around utility of the product services(Song et al., 2021). As a standalone theory, AIDA alone is also weak in explaining the actual behaviour of the target audience.

5.3.Integration of TAM+AIDA

According to TAM, perceived ease of use and perceived usefulness are the key motivational features in determining user attitude which in turn leads to the acceptance of new technology. Because of the parsimony of the model, numerous studies have applied TAM to understand user acceptance in information systems in diverse disciplines, yet it has been criticized for lower explanation of intention to use product. At the same time limited focus of AIDA model, demand for some integrated option.

In a bid to overcome the deficiencies of the TAM and AIDA and provide an understanding of the adoption process, this study takes an innovative approach by incorporating key constructs of the AIDA and TAM(Song et al., 2021). Previous research on digital health adoption has relied on applying a range of motivation theories like TAM, UTAUT.

In the quest of searching a suitable model/theory covering more comprehensive adoption process, integrated adoption model combining AIDA and TAM will be tested

Moderating variables

Moderating Variables	No of Studies
Gender	13
Age	9
Education	3
Experience	1
Income	1

As per the previous 65 research studies, most tested variables are Age, Education, and Income. Similar moderating variables will be tested in this research

5.1.Proposed Model

Considering the limitation of both model, and past literature on integration of some of the common variables, proposed theoretical model integrates TAM and AIDA model along with additional factors impacting intention to adopt (Figure 5.4)

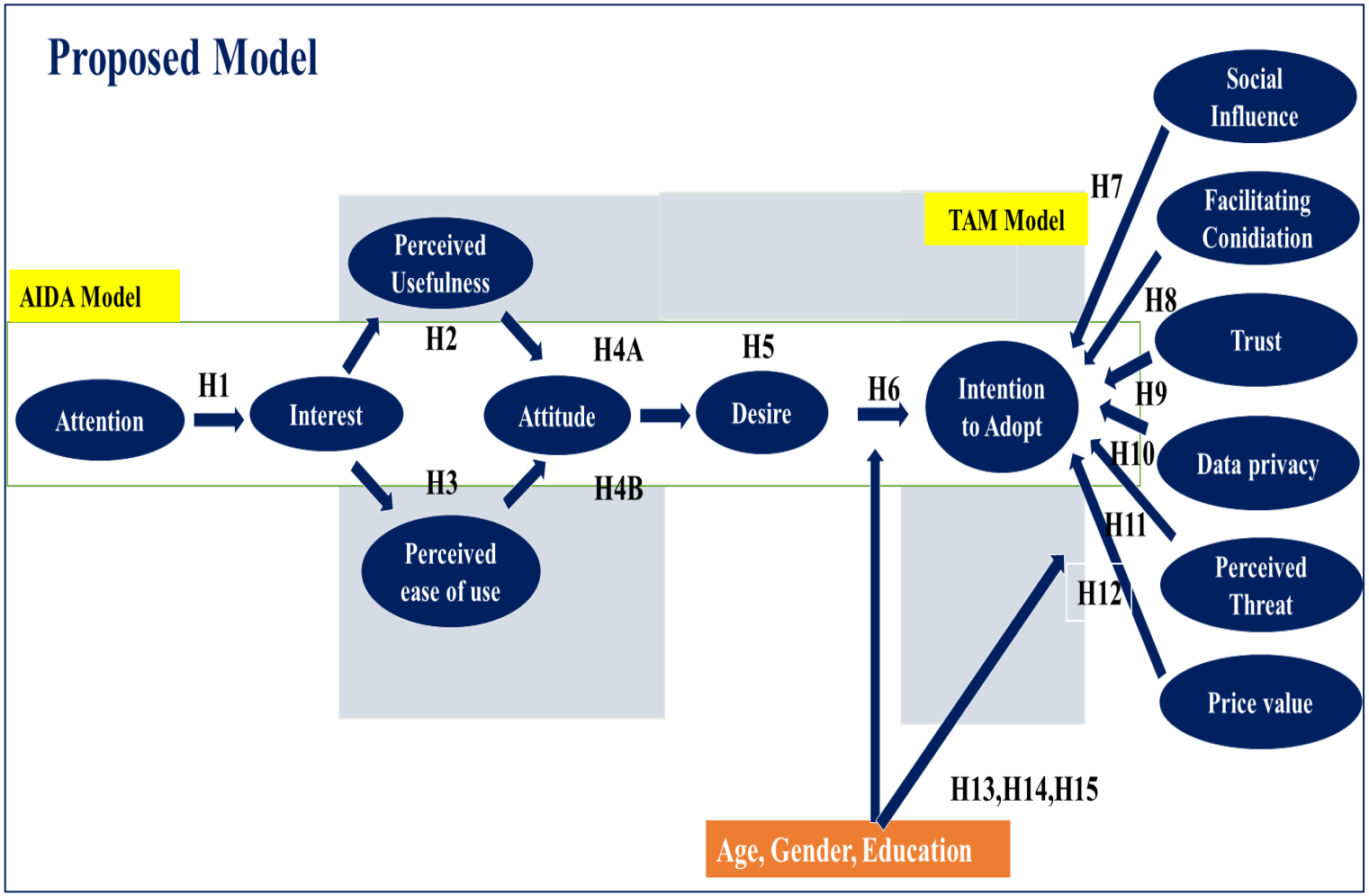

Figure 5.4 : Proposed Model

5.2.Variables and Hypothesis

Details of all the variables and Hypothesis from the proposed model are given below

1. **Attention**

Attention is the first step in the communication process when the consumer needs to learn of the existence of such a product or service. Author Song et al., (2021) tested relationship between attention and interest for food delivery apps. Similarly, in the proposed construct, following hypothesis will be tested.

H1. Attention –Interest

Null Hypothesis: Attention does not influence interest for digital health services

Alternate Hypothesis: Awareness positively influences interest for digital health services

2. **Interest**

Interest is the 2nd stage of communication receiver where the receiver starts generating interest in the topic of attention. As studied by Geng et al., (2022) for virtual reality, interest has a positive impact on perceived ease of use. Also, perceived usefulness and perceived ease of use mediate the relationship between interest and attitude.

H2. Interest – Perceived Ease of Use- Attitude

Null Hypothesis: Perceived Ease of use does not mediate the relationship in a positive direction between interest and attitude in the adoption of digital health services

Alternate Hypothesis: Perceived Ease of use mediates the relationship in a positive direction between interest and attitude in the adoption of digital health services

H3. Interest – Perceived Usefulness- Attitude

Null Hypothesis: Perceived Usefulness does not mediate the relationship in a positive direction between interest and attitude in the adoption of digital health services

Alternate Hypothesis: Perceived Usefulness mediates the relationship in a positive direction between interest and attitude in the adoption of digital health services

3. **Perceived usefulness**

Perceived usefulness (PU) – This was defined by Fred Davis as "the degree to which a person believes that using a particular system would enhance their job performance". It means whether someone perceives that technology to be useful for what they want to do. Attitude is mediating the relationship between perceived usefulness and desire as reported by Song et al., (2021) for food delivery apps. Similarly, in the proposed construct, following hypothesis will be tested.

H4A. Perceived usefulness - attitude - desire

Null Hypothesis: Attitude does not mediate the relationship in a positive direction between perceived usefulness and evaluation in the adoption of digital health services

Alternate Hypothesis: Attitude mediates the relationship in a positive direction between perceived usefulness and desire in the adoption of digital health services

4. Perceived ease of use

Perceived ease of use is defined as "the degree to which a person believes that using a particular system would be free of effort" (Davis, 1989). Attitude is mediating the relationship between perceived ease of use and desire as reported by Song et al., (2021) for food delivery apps. Similarly, in the proposed construct, following hypothesis will be tested.

H4B. Perceived Ease of Use - attitude - desire

Null Hypothesis: Attitude does not mediate the relationship in a positive direction between perceived ease of use and desire in the adoption of digital health services

Alternate Hypothesis: Attitude mediates the relationship in a positive direction between perceived usefulness and desire in the adoption of digital health services

5. Attitude

An attitude in marketing terms is defined as a general evaluation of a product or service formed over time. Attitude toward using a self-diagnosis application will have a direct positive effect on the intention to use a self-diagnosis application (Lanseng & Andreassen, 2007)

H5. Attitude-Desire- Intention to adopt

Null Hypothesis: Desire does not mediate the relationship in a positive direction between Attitude and intention to adopt of digital health services

Alternate Hypothesis: Desire mediates the relationship in a positive direction between Attitude and intention to adopt of digital health services

6. Desire

Desire is the human appetite for a given object of attention. Desire for a product is stimulated by advertising, which attempts to give buyers a sense of lack or wanting. As studied by Gang et al., (2022) for virtual reality, desire has a positive impact on intention to intention to tourism.

H6. Desire -Intention to adopt

Null Hypothesis: Desire does nor influence intention to adopt for digital health services

Alternate Hypothesis: Desire positively influences intention to adopt for digital health services

7. Social influence

Social influence defined as the degree to which that other (family, friends, peers, etc...) believes (either this believes are positive or negative) will affect. someone to use the new system (Venkatesh et al., 2003). As per Duarte & Pinho, 2019) social influence has a positive impact on mHealth adoption.

H7. Social Influence - Intention to adopt

Null Hypothesis: Social influence does not influence on Intention to adopt digital health services

Alternate Hypothesis: Social influence positively influences the Intention to adopt digital health services

8. Facilitating conditions

A FC is defined as "the degree to which an individual believes that an organization and technical infrastructure exist to support the use of the system" (Venkatesh et al., 2003, p.453). In case of digital health services, all the consumers are not getting access to same information. Hence, getting right resources will influence the adoption. Impact of facilitating conditions on m health was tested by (Duarte & Pinho, 2019)

H8. Facilitating conditions - Intention to adopt

Null Hypothesis: Facilitating conditions does not influence on Intention to adopt digital health services

Alternate Hypothesis: Facilitating conditions positively influences the Intention to adopt digital health services

9. Trust

Trust in technology refers to a willingness to depend on the specific technology in each situation in which negative consequences are possible. Trust in providers has a positive effect on the adoption of online health consultation.(Gong et al., 2019)

H9. Trust - Intention to adopt

Null Hypothesis: Trust does not influence on Intention to adopt digital health services

Alternate Hypothesis: Trust positively influences the Intention to adopt digital health services

10. Data Privacy

Data security is the practice of protecting digital information from unauthorized access, corruption, or theft throughout its entire lifecycle. Individuals 'perceived privacy risk affects their adoption intention in healthcare wearable device context(Li et al., 2016)

H10. Data Privacy - Intention to adopt

Null Hypothesis: Data privacy does not influence on Intention to adopt digital health services

Alternate Hypothesis: Data privacy positively influences the Intention to adopt digital health services

11. Perceived threat

This refers to a person's subjective perception of the risk of acquiring an illness or disease. There is wide variation in a person's feelings of personal vulnerability to an illness or disease. Perceived vulnerability is positively associated with individual's intention to adopt healthcare wearable devices.(Gao et al., 2015)

H11. Perceived threat to adopt

Null Hypothesis: Perceived threat does not influence on Intention to adopt digital health services

Alternate Hypothesis: Perceived threat positively influences the Intention to adopt digital health services

12. Price Value

Price value is defined as the "consumers' cognitive trade-off between the perceived benefits of the applications and the monetary cost for using them" (Venkatesh et al., 2012, p.161). Price value mentioned the acceptable price and price points at which consumers can consider this proposition a value for money. (Duarte & Pinho, 2019) reported that Price value impact on adoption of mobile health

H12. Price Value - Intention to adopt

Null Hypothesis: Price Value does not influence on Intention to adopt digital health services

Alternate Hypothesis: Price Value positively influences the Intention to adopt digital health services

13. Action – Intention to adopt

Intention to adopt is a predictor of behavior intention. As the penetration of digital health services is comparatively lower, Intention to adopt is primarily used as a dependent variable to understand about the adoption process

Demographic parameters

14. Age:

Since the advent of computer-based technologies, it has been widely acknowledged that elderly people have lagged in embracing and using them. This is because older people, for a variety of reasons, are unable to access and fully utilise IT capabilities. The relationship between PEOU and PU is moderated by age in a way that makes it stronger for older individuals (Faqih & Jaradat, 2015)

H13: Age as a Moderating variable

Null Hypothesis: Age does not moderate the effect of (Desire, Social influence, Perceived threat, Trust, Social influence, facilitating conditions, Price Value, Data privacy) on intention to adopt digital health services

Alternate Hypothesis: Age moderates the effect of (Desire, Social influence, Perceived threat, Trust, Social influence, facilitating conditions, Price Value, Data privacy) on intention to adopt digital health services

15. Gender:

A lot of research has been done on how gender affects how various IT fields are adopted. There is no question that males are more likely than women to decide to use a new technology innovation, particularly Internet technologies, as evidenced by the literature. This study shows that gender moderates the association between perceived usability and behavioural intention to embrace mobile healthcare, with the effect being stronger for women than for males (Faqih & Jaradat, 2015)

H14: Gender as a Moderating variable

Null Hypothesis: Gender does not moderate the effect of (Desire, Social influence, Perceived threat, Trust, Social influence, facilitating conditions, Price Value, Data privacy) on intention to adopt digital health services

Alternate Hypothesis: Gender moderates the effect of (Desire, Social influence, Perceived threat, Trust, Social influence, facilitating conditions, Price Value, Data privacy) on intention to adopt digital health services

16. Education:

People with less education would consider new technologies to be laborious and challenging to understand, therefore whether they choose to adopt e-learning systems will rely on how simple the technology is to use. Previous research revealed that users with less knowledge are more likely to experience computer anxiety, which lowers computer self-efficacy, which may also affect perceptions of ease of use (Binyamin et al., 2019)

H15: Education as a Moderating variable

Null Hypothesis: Education does not moderate the effect of (Desire, Social influence, Perceived threat, Trust, Social influence, facilitating conditions, Price Value, Data privacy) on intention to adopt digital health services

Alternate Hypothesis: Education moderates the effect of (Desire, Social influence, Perceived threat, Trust, Social influence, facilitating conditions, Price Value, Data privacy) on intention to adopt digital health services

6. Research Design

A research design is a blueprint or plan for the collection, measurement, and analysis of data, created to answer your research questions. Below are various dimensions of the research design which will be followed while executing this study.

6.1.Type of research

Survey Research: A survey research method include collection of information from people about their usage, knowledge, attitude, and behavior (Uma Sekaran,2013). Surveys are often used to find out consumers usage pattern, behavior, decision making process, purchase journey, preference analysis etc. This research will be completed with the help of Survey research method. The questions in the survey will be designed as a self-administered mode where respondent can enter their feedback or can be administered through interviewer.

Study setting: There are two types of settings i.e non contrived where events happen normally and contrived setting where events happen artificially. Contrived setting will be used for this research.

6.2.Unit of research

Unit of research refers to the level of aggregation of the data collected during subsequent analysis stage. While finding out the adoption process and impact of various factors on adoption, individual level data will be collected for this research

6.3.Time Horizon:

There are two types of surveys i.e. cross sectional or longitudinal. Considering the objectives of one time understanding of the adoption process, cross sectional data collection method will be used for this study.

6.4.Data collection:

A structured questionnaire will be prepared as per the theoretical model and the same will be administered to collect data through primary surveys. All the questionnaires will be administered personally.

6.5.Sampling Design:

Sampling design refers to the probability of any given sample being drawn. There are various components of sampling design as summarized below

6.5.1. Defining the population: Sampling will start by precise definition of population. Target population for this research will be all adults who are aware about digital health services across top two metro cities.(Hoque, 2016)

6.5.2. Sampling Frame: The sampling frame is a (physical) representation of all the elements in the population from which the sample is being drawn. All the adults who are aware about digital health services from Mumbai and Delhi will be contacted for this research. Depending upon the geography, Mumbai city will be further divided into Mumbai, Mumbai Suburb, Thane, Navi Mumbai. Similarly, Delhi will be further divided North, East, South and New Delhi for proper spread of sample.

6.5.3. Sample size

As suggested by Hair et al (2007) and Uma Sekaran (2006), sample size above 500 would be adequate for larger studies where population is more than 1 lakh. Also, as per the logic of Z test for sample size calculation, a sample of 385 respondent will be adequate for any large study at 95% confidence interval with population proportion of 50% and 5% margin of error (Bolarinwa, 2020)

Andrew Fisher's Formula:

Sample Size (n) = $Z^2\, pq/e^2$

Z=1.96 at 95% confidence interval

P =0.5 (Proportion pf the characteristics under study)

q =p (1-0.5)=0.25

e = margin of error =0.05

Hence, n= $(1.96)^2(0.25)/0.05)^2$ =385

Considering, both references, a sample size of 500 will be considered for this research with some additional sample. Also, due to the ethnic diversity in Mumbai and Delhi, both these cities represent mini-India. Hence, sample selection will be done across these two cities in proportion to their population as given below

City	Adult Population (Ref: CENSUS 2011)	% Of population split within 2 cities	Sample Size
Mumbai MMR	1.6 Cr	57%	285
Delhi, Gurgaon, and Noida	1.2 Cr	43%	215
TOTAL			**500**

6.5.4. Stages of Sample Selection

Step 1: List the population: To initiate sampling process, listing exercise will be carries out to make a list of people who are aware about Digital health services

Step 2: Assign numbers to the units: Consecutive numbers from 1 to N, next to each of the respondent will be given. Consecutive numbering will help to select random sampling. of people who are aware about

Step 3: Find random numbers: Random numbers will be selected from the newly constricted list. These random numbers can either be found using random number tables or a computer program that generates these numbers.

Step 4: Select your sample: Simple random sampling will be done where respondents will be selected as per the random number selected at step-3 above.

6.6.Measurement

To ensure the content validity of the scales, items selected for the constructs were mainly adapted from previous studies and modified to fit Digital health services adoption in the context of India. Various observed statements under each latent variable will be selected and ask to respondents for their agreement on five-point Likert scales where 5 - strongly agree and 1 - strongly disagree.

Variables and Items

Below are the variables and items for the measurement as per proposed construct

Variables and Items	Reference
Attention (ATN)	
I have seen advertisements about digital health services	(Song et al., 2021)
I have noticed various promotional communications about digital health services	
I have seen internet advertising / Social media advertising about digital health services	
I have heard about Digital health services	
Interest (INT)	
My life is closely related to digital services for managing health	(Song et al., 2021)
I become positive when I think of digital services for managing health	
I like the advertisements of digital health services	
I become interested in digital health services	
Perceived Usefulness (PU)	
Using the digital health services will improve the quality of my life	(Zhang et al., 2017)
Using the digital health services will mean more health-care conveniences	
Using the digital health services will make my life more effective	
Generally, I find the digital health services to be useful in my life	
Perceived Ease of Use (PEOU)	
Learning to operate the digital health services will be easy for me.	

I can easily become skillful at using the digital health services.	(Zhang et al., 2017)
I can get the digital health services to do that I want.	
Generally, the digital health services are easy to use.	
Perceived Health Threat (THREAT)	
I find that I can get easy health recovery compared with others	(Lin, 2011)
I find that I might have high blood-pressure, diabetes, heart disease and other chronic diseases in the future	
I find that my health is getting poor than times before	
I find that I might have high blood-pressure, diabetes, heart disease and other chronic diseases in the future, and would be forced to change my previous way of life	
Attitude (ATT)	
I like using Digital health services	(Lin, 2011)
When I need, using Digital Health services is considered to be an ideal way	
I am willing to introduce Digital Health Services to others	
As a whole, I find using Digital Health services to be an ideal way	
Social Influence (SI)	
People who are important to me think that I should use digital health services.	Venkatesh et al. (2003);
People who influence my behavior think that I should use digital health services.	
People whose opinions that I value prefer that I use digital health services.	
People in my society who use digital health services have more prestigious than those who do not	
Facilitating condition (FC)	
I have the resources necessary to use digital health services	Venkatesh et al. (2003);
I have the knowledge necessary to use digital health services.	
digital health services is compatible with other technologies I use.	
I can get help from others when I have difficulties using digital health services.	
Guidance will be available to me in the use of digital health services.	
Data Security / Privacy (PRI)	
It would be risky to disclose my personal health information to vendors providing digital health services	Li et al. (2014)
There would be high potential for loss associated with disclosing my personal health information to vendors providing digital health services	
There would be too much uncertainty associated with giving my personal health information to vendors providing digital health services	
Trust (TRU)	
This digital health services provider is trustworthy.	(Akter et al., 2013)
This service provider gives reliable inform	
This service provider keeps promises and commitments	
This service provider's behavior meets my expectations	
Price Value (PV)	
It enables me to use health services at a reasonable price.	Venkatesh et al. (2012)
Digital health services are good value for the money	
At the current price, digital health services provide a good value	

Desire (DES)	
My hope for a digital health service is passionate.	(Song et al., 2021)
I hope to use a digital health service soon.	
I want to use a digital health service right now.	
Intention to use (ITU)	
I intend to continue using digital health services in the future	Wixom and Todd (2005)
I will always try to use digital health services in my daily life	
I plan to continue to use digital health services Frequently	

7. Data collection and analysis

7.1.Data collection method:

Considering the impact of COVID 19 and risk of infection transfer, data collection will be planned in the hybrid mode. As per the convenience of the respondents, face to face interviews or surveys through online portal like google forms will be conducted(Lefever et al., 2007)

7.2.Data Analysis

Collected data will be cleaned first and then analyzed with the help of various statistical analysis (Wangikar et al., 2011)

Data entry and cleaning

Data entry: Data collected through normal face to face interviews will be entered SPSS software

Coding: Post coding will be done for open end questions if Any

Editing: Data will be further edited for any outliers / missing data points

Data transformation: Data will be transformed as per the need of variables

Analysis scheme

Data analysis will be initiated with understanding the central tendency of the data i.e Mean, median, mode and descriptive statistics with the help of software like SPSS. Tables will be generated for frequency of various parameters. This analysis will be followed by confirmatory factor analysis for to find out latent clusters. Once the clusters are ready, PLS SEM technique will be used to find out relationship between different variables. Following are some of the techniques which will be used for analysis

Analysis	Statistical tests to be used
Central Tendency of the data	Frequencies analysis
	Descriptive statistics
	Measuring central tendency and data distribution
Relationship between Variables	Z test
	t Test
	ANOVA
	Chi square test
	Correlation Analysis
	Regression

Stages of Adoption	Latent variable analysis
	Data reliability and Validity analysis
	Inter-dependency of variables
	Path analysis using PLS / AMOS
Perceptions and factors influencing adoption process	Latent variable analysis
	Data reliability and Validity analysis
	Inter-dependency of variables
	Structural Equation modelling using PLS / AMOS
Integration of AIDA + TAM	Structural Equation modelling with PLS / AMOS
Moderation Variables	Impact of moderating variables using PLS / AMOS
Hypothesis Testing	Hypothesis testing basis the appropriate statistical techniques

8. Expected Outcomes of the study

This research is expected to give descriptive analysis of the consumer profile in terms of geography, gender, age, income, and other profiling parameters. Along with the profiling parameters, attention towards digital health will also be analyzed. It is also expected to give perceptions around digital health services. Impact of various perceptions and factors on adoption of digital health will also be found out (Tam et al., 2020). All these insights will be very useful for the digital health service providers.

Adoption process of digital health services will be validated with the help of AIDA model. Detailed Path analysis will be done to understand the dependability of various stages of adoption. At the same time, at last, integrated model combining AIDA and TAM will be tested for its overall influence on the intention to adopt digital health services. In addition to this moderating effect of various demographic factors like Age, Gender and Education will also be analyzed.

8.1.Research Benefits / Research applications in real life

In a real-life scenario, digital health can be a magical wand for needy patients. This research will provide understanding around consumer perceptions which is important for service designers while developing various digital health services.

Findings around AIDA model can be used to assess the impact of communication on the adoption of digital health services and hierarchy of communication transfer and its overall impact on adoption of digital health. All these insights will be highly useful for the service providers while they are communicating various features and benefits of the Digital health services. Insights from the integrated model can be used to plan the digital health services in both private and public sectors.

8.2.Limitations of the study

This research will be focusing on adoption of digital services amongst consumers. Other stakeholders in the healthcare space like physicians, nurses and other health care staff will not be included in the study. Also, geography wise, this study will be conducted across 2 metro cities and hence, the findings of the research cannot be generalized at pan India level. In addition to that, only two models will be tested in this study. Technology adoption can be explained by many other models. Furthermore, m-Health, Wearable, ICT and Telemedicine are the only core services tested in this research, all other services are excluded from the research

9. Timeline

Research will start with a comprehensive review of literature where all relevant literature from the past will be searched, analyzed, and organized in a systematic manner. This phase will be followed by the development of a data collection instrument, a sample plan, and data collection. Post completion of data collection, detailed analysis will be carried out with the help of various software like SPSS and PLS. Finally, a draft of the thesis will be completed, incorporating the review of literature, research methodology, data collection and analysis, and conclusion of the research. Below is the summary of the timeline as per the different stages of research.

	Activities	**Timelines**
Review of Literature	Search, capture and synthesize relevant literature,	**6 months**
	Prepare draft literature review	
Data collection	Develop data collection instrument	**8 months**
	Pre-test/pilot data collection instrument	
	Finalize sampling plan Carry out data collection	
Data analysis	Prepare data for analysis	**4 months**
	Analysis of Data	
	Draw conclusion and Recommendations	
Thesis Writing	Final Draft of Application	**4 months**
	Review draft	
	Final Editing	
	Submission	

10.Chapter scheme

Following chapter scheme will be followed while writing the thesis.

Title page

Certificate from Guide

Examiner's Sheet

Abstract

Chapter 1: **Introduction**

Chapter 2: **Review of literatures and conceptual framework**

Chapter 3: Research Methodology

Chapter 4: **Data Collection and Analysis**

Chapter 5: Results and Discussion

Chapter 6: Recommendations

6.1 Summary of suggestions

6.2 Limitations

6.3 Scope for further work

Appendix

Bibliography

Questionnaire

Acknowledgement

11.Bibliography

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